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U.S. Department of Housing and Urban Development
Office of Policy Development and Research

The Affordable Housing Demonstration

Tulsa, Oklahoma

A Case Study

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The Joint Venture for Affordable Housing

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THE SECRETARY OF HOUSING AND URBAN DEVELOPMENT
WASHINGTON, D.C. 20410

January 1986

Four years have gone by since I announced the formation of the Joint Venture for Affordable Housing as a public-private partnership to make homeownership available to more people by combating the problem of high housing costs due to outdated and unnecessary building and land use regulations. Much has been accomplished toward this goal.

We in the Federal government can point with pride to several achievements. Mortgage interest rates, which were approaching 20 percent when this Administration took office, have been brought down by the President's economic recovery program by almost half; they are generally ranging from 10 1/2 to 11 1/2 percent in most parts of the country. At the same time, the Department of Housing and Urban Development's Federal Housing Administration has made it much easier for builders to obtain project approvals both by streamlining mortgage insurance processing and by simplifying HUD's own regulatory requirements; rather than impose a second set of rules in the Minimum Property Standards, HUD's Field Offices now accept projects meeting local building codes in most instances.

Equally significant progress has been made by many local communities. Local government officials and builders have cooperated to create new "affordable housing demonstrations" all across the country. With savings as much as $10,000 per home in some projects, many more families have been able to buy their own homes. As these projects are completed, put on the market, and often sold out, their history and the savings which have been achieved are described in case study reports.

This is one of several new reports describing projects completed during the past year. Each project is different, and each case study has its own story to tell. I urge you to read this case study and the other new reports, as well as the 12 which preceded them, and to use the ideas described therein as they apply to your situation in your community. These ideas will help bring the cost of new housing in your community down to levels where more people can afford housing, and that is what we all want to happen.

Very sincerely yours,

Samuel R. Pierce, Jr.

The Affordable Housing Demonstration
A Case Study

Tulsa, Oklahoma

Prepared for:
U.S. Department of
Housing and Urban Development,
Division of Building Technology

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November 1985

This report was produced by the NAHB Research Foundation, Inc., for the United States Department of Housing and Urban Development. The views and conclusions contained herein are those of the authors and should not be interpreted as necessarily representing the official view or policies of the United States Government.

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Summary

Tulsa, site of one of Oklahoma's Affordable Housing Demonstration, is about 90 miles northeast of Oklahoma City and 60 miles from the Kansas and Arkansas borders. Tulsa's 379,000 (1984 U.S. Census) residents inhabit 117 square miles of land. Approximately 70 percent of the population owns housing, and 73 percent of respondents to a marketing survey believed home ownership to be a realistic goal. A typical first home in Tulsa in 1984 cost $79,500.

Tulsa's Mayor Jim Inhofe wanted to involve the city in the Affordable Housing Demonstration as soon as HUD announced the program, and official designation came on April 7, 1982. The mayor, city commissioners and staff, home builders association, and developer worked cooperatively on the demonstration, called Innovare Park.

Hood Enterprises, builder of Innovare Park, is an established company -- one of the top 10 volume builders in the Tulsa area. President D. Wayne Hood and Vice-President Ron Latimer take pride in their innovative designs, site plans, construction techniques, and house features.

Innovare Park (innovare is French for innovation) consists of 86 single-family detached units on 7.98 acres. The homes are priced from $47,000 to $63,000 and are available in seven models. All models have air conditioning and garage or carport. Options include fireplace with heated air circulator, garden window in the kitchen, ceramic tiled entry, ceiling fan, and vinyl siding.

Changes in Tulsa's regulations and building practices produced considerable cost savings for the project. Site planning and development changes saved $10,390 per unit. Cost savings due to building design and construction changes amounted to $2,079 per unit. Total savings per unit were approximately 30 percent of the total unit cost.

Thirty homes had been sold from house plans by the Grand Opening on March 26, 1984. By June 1985, 47 homes had been sold.

Summary

The Joint Venture for Affordable Housing

Housing costs have risen dramatically in recent years, so that many people have been unable to buy a home. Part of this cost increase was due to the high rate of interest on home mortgages, which reached almost 20 percent in some areas of the country before dropping under 13 percent in 1985.

A large part of the increase, however, was due to other factors -- inflation in the cost of materials and labor, a reduction in the amount of land available for housing, which has drastically increased lot prices, and changes in market patterns leading to larger homes on larger lots. Recent studies by the President's Commissioners on Housing and by a special U.S. Department of Housing and Urban Development (HUD) Task Force on Housing Costs confirm the findings of earlier studies which show that ways exist to cut the cost of housing, if they are used. Too often, these studies show, out-of-date regulations and building practices prevent these ideas from being applied. In fact, the studies pointed out that many builders and local officials do not even know about many of the ways that exist to reduce housing costs.

The Joint Venture for Affordable Housing was initiated by HUD Secretary Samuel R. Pierce, Jr., to correct this situation. Since affordable housing is a problem which involves all levels of government as well as the rest of the housing industry, finding an answer requires the participation of all of these elements. The Joint Venture, therefore, is a real partnership of the following organizations, all of whom have an interest in making housing more affordable:

- American Planning Association
- Council of State Community Affairs Agencies
- International City Management Association
- National Association of Counties
- National Conference of State Legislatures
- National Governors' Association
- Urban Land Institute
- National Association of Home Builders and the NAHB Research Foundation
- U. S. Department of Housing and Urban Development

Through conferences, workshops, demonstrations, publications, and similar activities, each of these organizations is helping to identify ways to cut construction costs through more effective and efficient planning, site development, and building procedures, and to provide this information to its members.

The Affordable Housing Demonstrations

Home builders learn from other builders; successful ideas are copied and used in new ways by other builders in many different areas of the country. The affordable housing demonstrations have been developed to illustrate ideas for reducing housing costs in real projects and to provide information on the cost savings that resulted.

The central theme of the demonstration program is that a builder and those local officials responsible for regulatory approval can, together, identify ways to reduce the cost of housing and to modify or interpret local building codes and site development regulations so that these

methods can be used. In the demonstration program, no Federal funds are provided either to the builder or to the community to support the demonstration projects. HUD and the NAHB Research Foundation do provide technical assistance through various publications documenting previous research studies and through suggestions to the project designers, but it is the builder's responsibility to develop a list of possible cost-cutting ideas and it is the responsibility of local officials to accept those which are reasonable for that community.

Participating builders and communities were selected for the demonstration program in several ways. Before the Joint Venture was announced in January 1982, HUD approached a number of communities which had already demonstrated, in other activities, a willingness to modify regulations and to take other steps to encourage local development. As these communities agreed to participate in the program, the National Association of Home Builders worked through its local associations to identify builders in the communities with reputations for quality and records of innovation. Following announcement of the first twelve communities and builders selected to participate in the demonstration program, many other communities and builders expressed interest in joining the program. In each case, HUD required a formal commitment by the highest elected official that the local government would support the program.

Once a project was accepted, HUD and the NAHB Research Foundation assisted the builder to identify cost-cutting ideas and to develop a workable, attractive site plan. The cost-cutting measures used in the various demonstrations vary widely. In some projects, unit densities were increased to reduce the impact of land cost on the final price, while good site planning and design made this increased density acceptable to the community. In other projects, street widths, street design standards, and utility system requirements were changed to reduce costs. Housing materials and construction methods were changed in many projects. In addition, many projects benefited from improvements in local administrative procedures which reduced the time and effort needed to obtain building and land use approvals.

The Case Study Approach

Each project undertaken as an Affordable Housing Demonstration as part of the Joint Venture for Affordable Housing is being described in a case study report. The case studies are intended to be learning tools to help home builders, local officials, and others concerned about affordable housing recognize and seize opportunities to reduce housing costs through regulatory reform and the use of innovative planning and construction techniques.

Information on the changes and their impact on costs has been collected by the NAHB Research Foundation. Each case study describes the community, outlines the builder's experience, and discusses the specific project characteristics and history. Where possible, the cost savings resulting from the use of the various procedural, planning, development, and construction changes are calculated and reported in the case studies.

The following material provides this information on the Affordable Housing Demonstration project in Tulsa, Oklahoma.

Chapter 1

Project Description

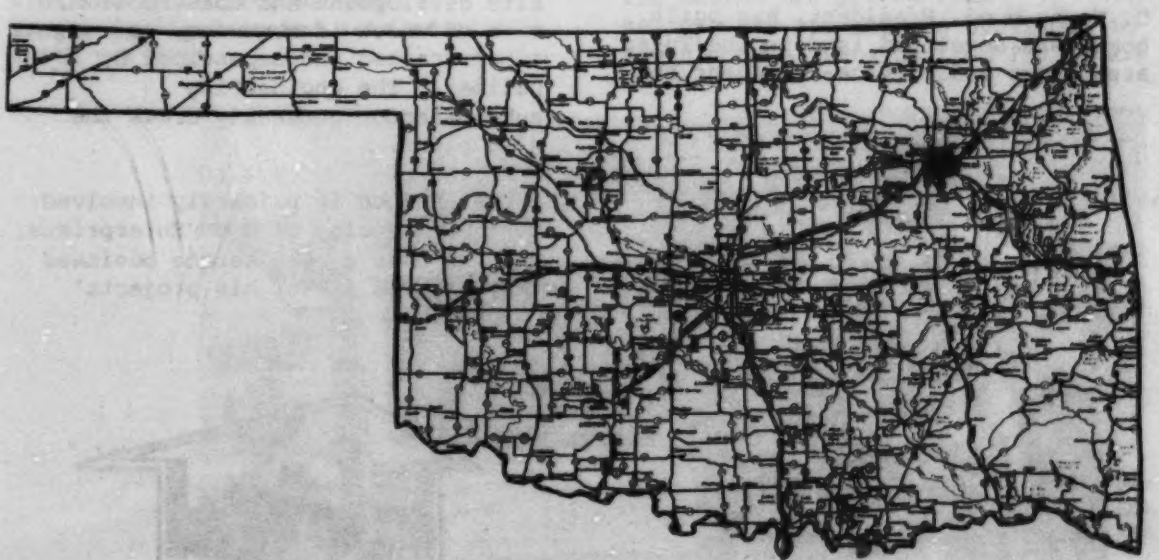
The Community - Tulsa, Oklahoma

Tulsa is located in the northeastern quadrant of Oklahoma, about 90 miles northeast of Oklahoma City and about 60 miles from the Kansas and Arkansas borders. The incorporated city covers 117 square miles. The climate is temperate, with a winter mean temperature of 45° and a summer maximum temperature of 107° with 80 percent humidity. Average annual precipitation is 44.9 inches.

According to the Department of City Development, the population of Tulsa City was 379,000 in 1984 and projected to be 386,100 in 1985. Growth ranged between 5 and 7 percent during 1982 and 1983 and has dropped to about .5 percent during 1984 and 1985.

Tulsa's industry consists mainly of oil and gas, aeronautics, and metals fabrication. Some major employers in the area are American Airlines, Cities Service Oil and Gas Corp., and Rockwell International. The unemployment rate in February 1985 was 7.8 percent, up .9 percent from the year before.

Average household income for the Tulsa metropolitan area was $36,814 in 1984, and average household size was 2.67 persons. The income of the average factory worker was $21,724 in February 1985, up 1.2 percent from one year earlier. Approximately 70 percent of the population owns housing, 23 percent rents housing, and 7 percent lives with family. A typical first home cost $79,500 in 1984 and is expected to cost approximately $85,000 in 1985. Tulsa's rental vacancy rate exceeds 25 percent, but builders continue to construct new apartments. In February 1985 construction activity was down 4.1 percent from one year earlier. The city issued 10,123 building permits in 1984 with a total value of $374.8 million; 3,390 new



residential units were authorized by building permits.

Tulsa operates under a mayor/commission form of government. The five commissioners and mayor are elected every two years on a partisan ballot.

The city's master planning is directed by the Indian Nations Council of Governments (INCOG) and the Tulsa Metropolitan Area Planning Commission (TMAPC). INCOG is responsible for overall planning review of Tulsa and 23 other localities, and TMAPC reviews regional proposals.

The Builder - Hood Enterprises, Inc.

Hood Enterprises is in the top ten of volume builders in the Tulsa area. D. Wayne Hood, President, has built homes and developed land in the Tulsa area since 1953. Vice-President Ron

Wayne Hood - President

Ron Latimer - Vice President

Latimer has been in the construction business for 25 years.

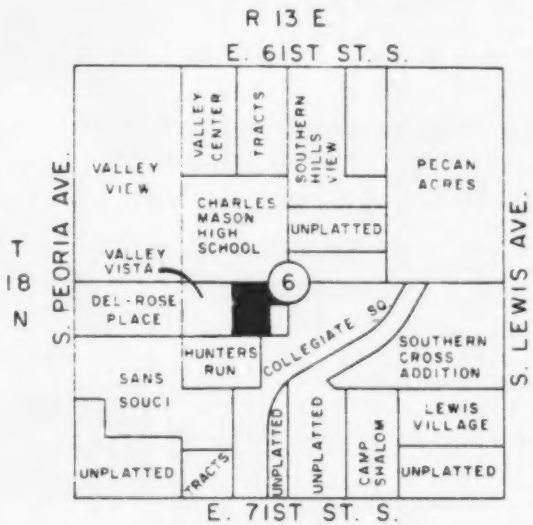
Hood Enterprises built approximately 100 single-family detached units per year in the past five years. Approximately 90 percent of these units range in size from 1,100-1,400 square feet and sell for $60,000-$70,000. About 10 percent were in the $70,000-$85,000 range. Hood and Latimer continually try new ideas and technologies and take pride in their experimental designs, site plans, construction techniques, and house features. All Hood Enterprises site development and construction, most of which is nonunion, is subcontracted and supervised by Latimer. The engineering subcontractor generally draws the site plans.

D. Wayne Hood is primarily involved in the financing of Hood Enterprises. He also owns a real estate business that handles all of his projects' sales.

Hood has been an active member of the National Association of Home Builders (NAHB) and its local organization, the Builders Association of Metropolitan Tulsa (HBA) for 31 years. He served as chairman of the HBA Building Committee in 1964 and the HBA Parade of Homes in 1966. A Life Director of NAHB since 1977, Hood was elected a National Director by the HBA for the years 1967 to 1981, served as president of the Oklahoma State Builders Association from 1976 to 1977, was Oklahoma Builder of the Year in 1980, was NAHB Vice-President for Area 12 (Oklahoma and Texas) in 1981, and is a trustee for National Build-Pac.

The Project - Innovare Park

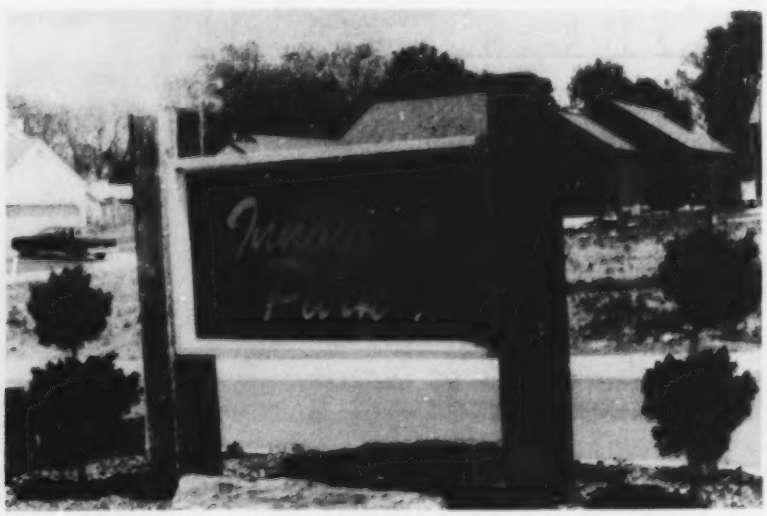
Innovare Park is in the southern part of Tulsa in a largely residential area of single-family detached, single-family attached, and multifamily units. The original plan for the 7.98-acre site proposed 34 single-family detached lots at a density of 4.42 units per acre. Another design proposed 79 single-family detached lots for a density of 10.26 units per acre. The final revision proposed 86 single-family detached lots of 11.17 units per acre.

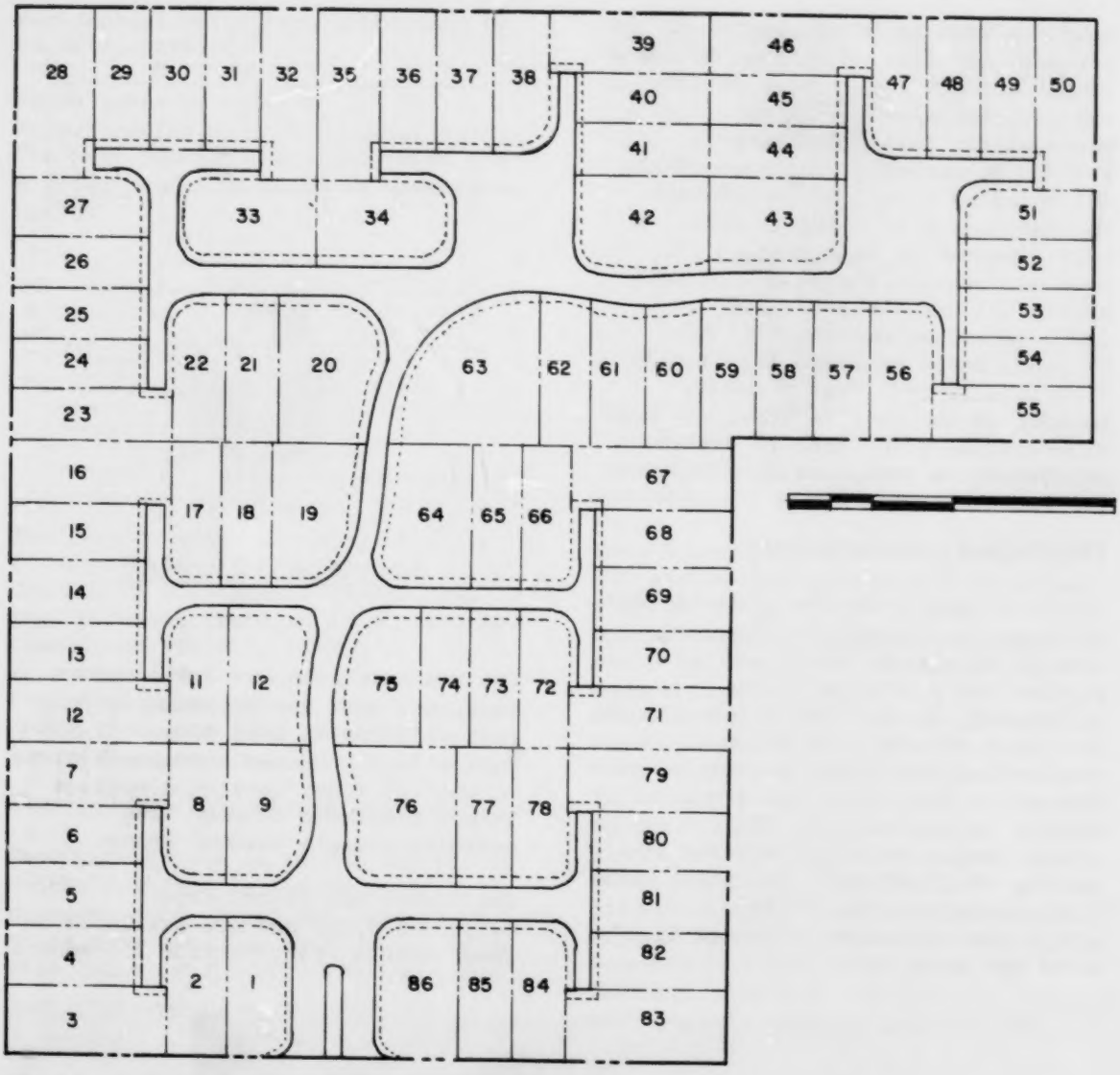


LOCATION MAP

The smallest lots are 2,250 square feet, but most are approximately 35 feet wide and 80 feet deep or 2,800 square feet. Houses are placed close to the lot line, leaving a minimum 5-foot clearance between them to maximize useable outdoor space.

The houses are priced from $47,000-$63,000 and are available in seven models, ranging from 750 square

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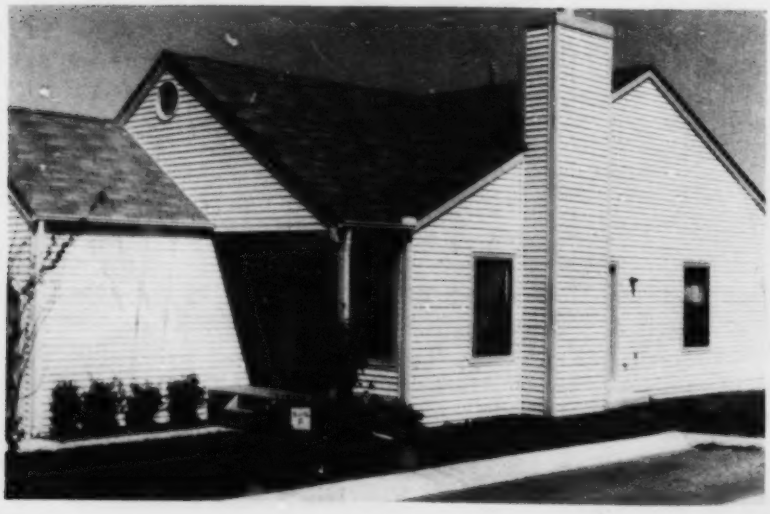
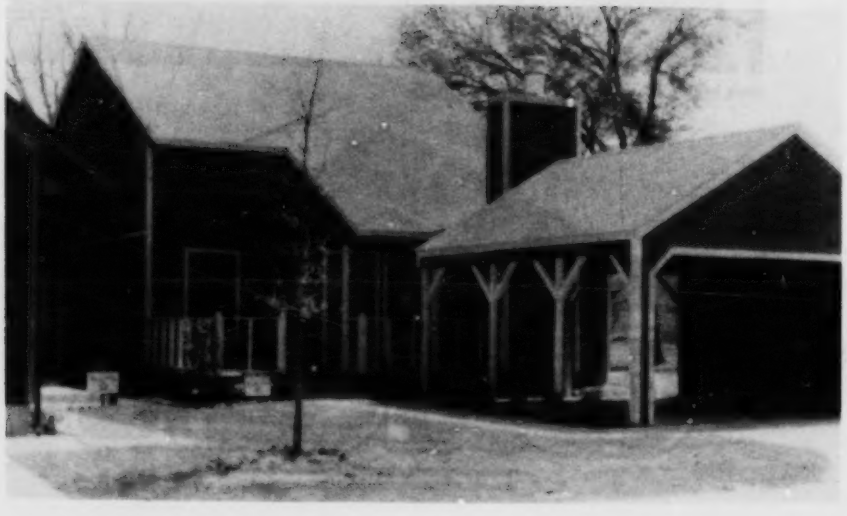
Site plan



Model units



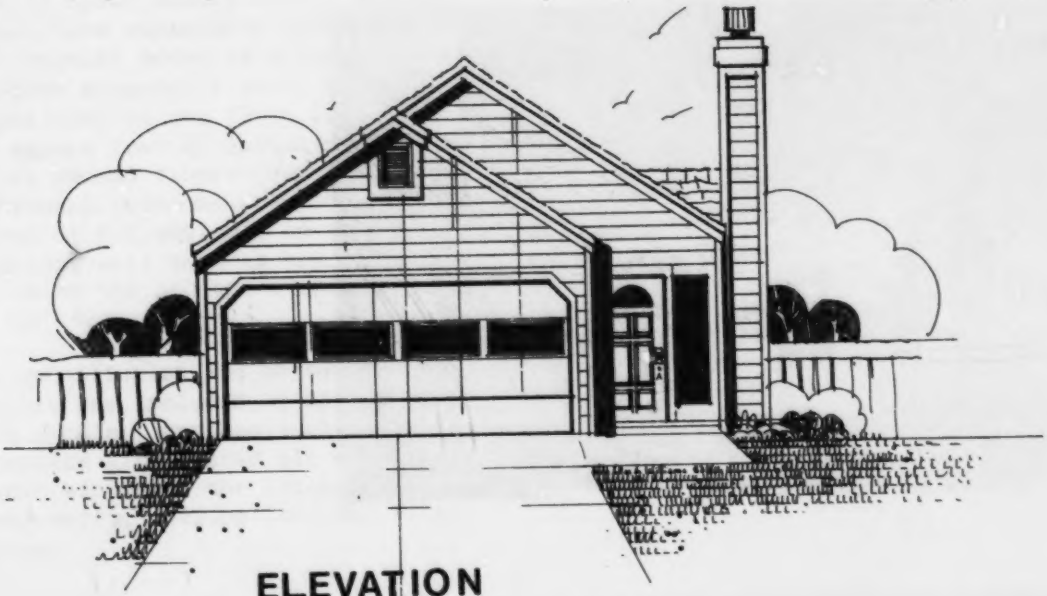
feet to 1,100 square feet. Several models have expandable space. The most popular model is a one-bedroom, one-bath expandable unit, with 880 square feet on the first floor and 450 square feet of unfinished space on the second floor--room for two additional bedrooms and another bath. Priced at $52,000, all 10 units of this type were sold in the first week following the project's opening in spring 1984.

Air conditioning and garage or carport are included in all Innovare Park models. Options include fireplace with heated air circulator, garden window in the kitchen, ceramic tiled entry, ceiling fan, and vinyl siding.

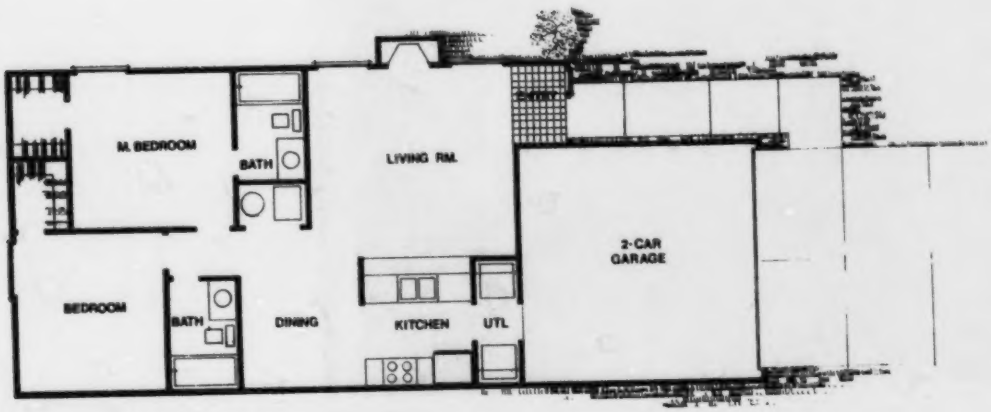
The homes were certified by Good Cents Homes Program, which means they were built according to a general set of guidelines for materials and equipment resulting in energy bills approximately 50 percent less than normal. Latimer documents utility savings of up to 68 percent on the Innovare Park homes.

All homes are built on all-weather wood foundations, unusual for the Tulsa area. Hood and Latimer decided on this innovation to reduce initial home price and increase energy efficiency. Homes are of wood frame construction and most have wood siding. Vinyl siding was an option.

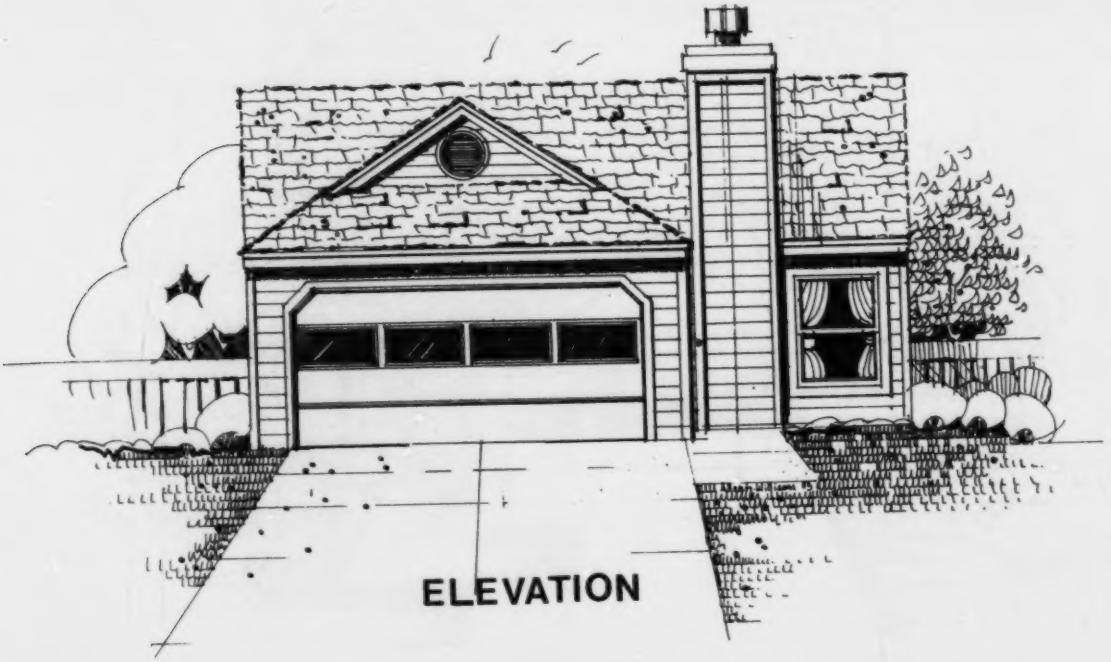
Unit interior



ELEVATION



FLOOR PLAN "A"



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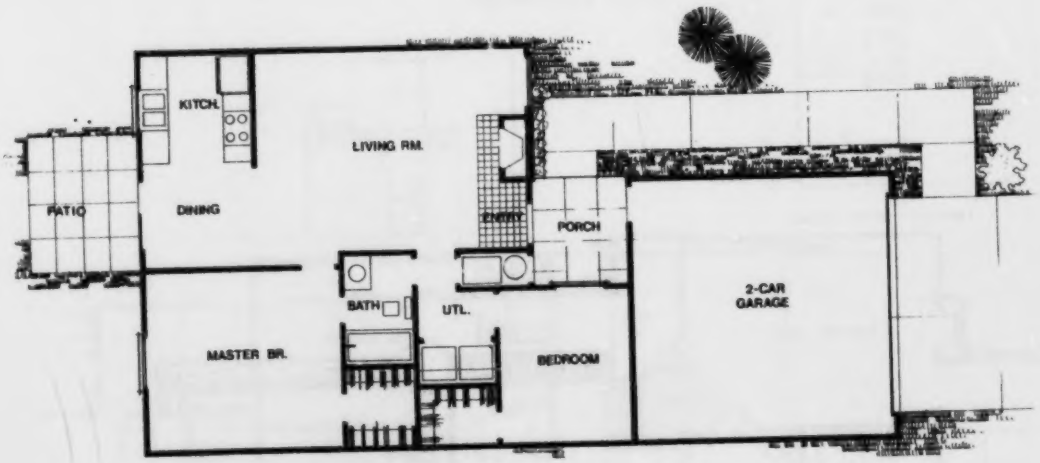
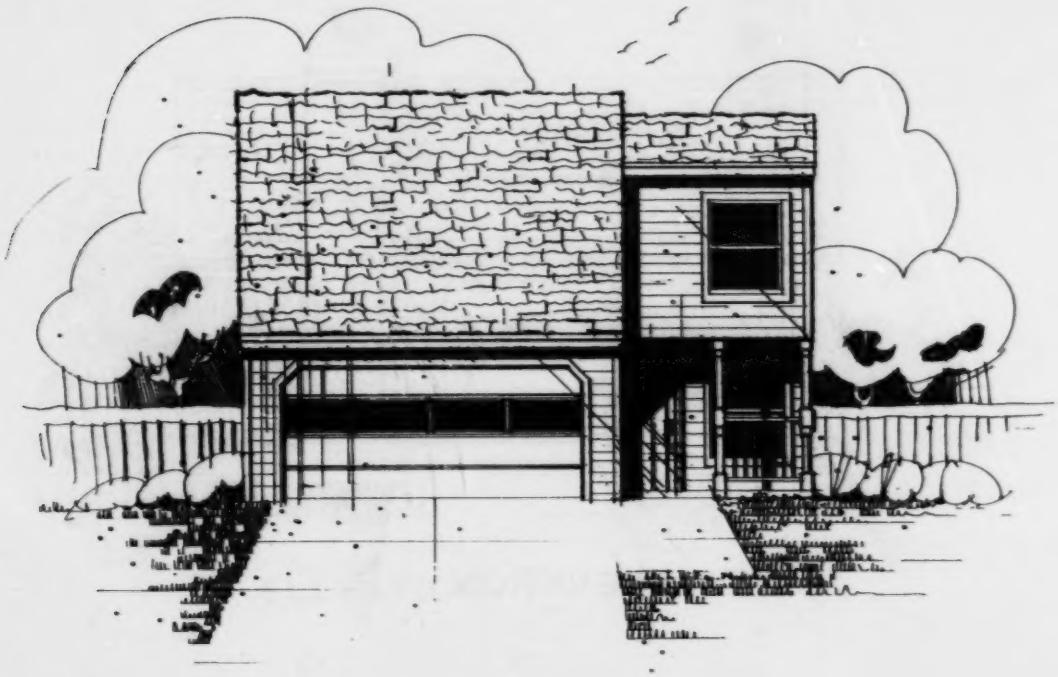


FLOOR PLAN "B"



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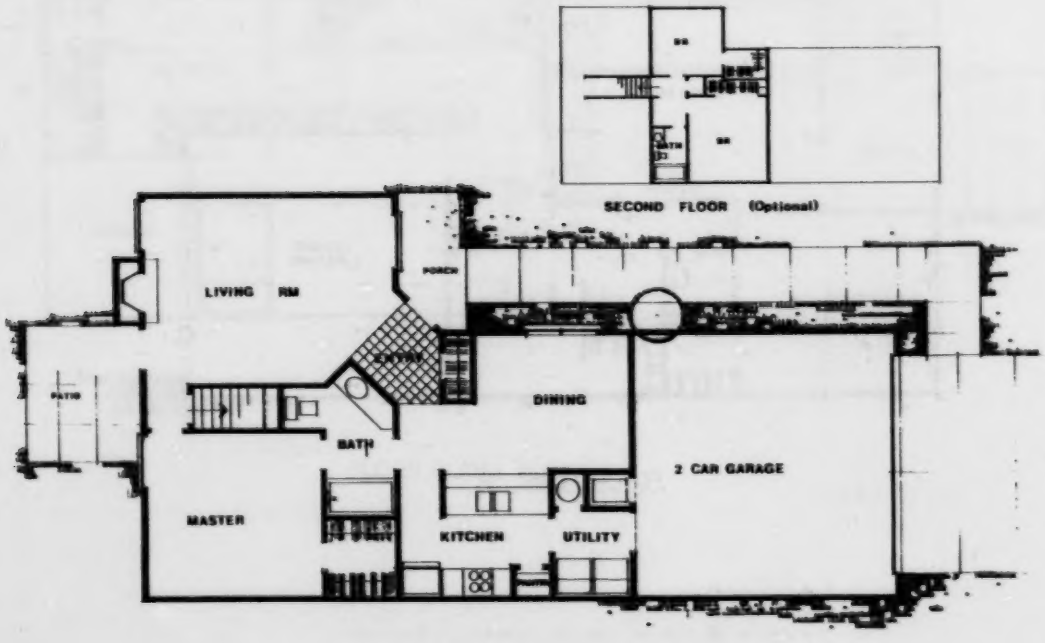
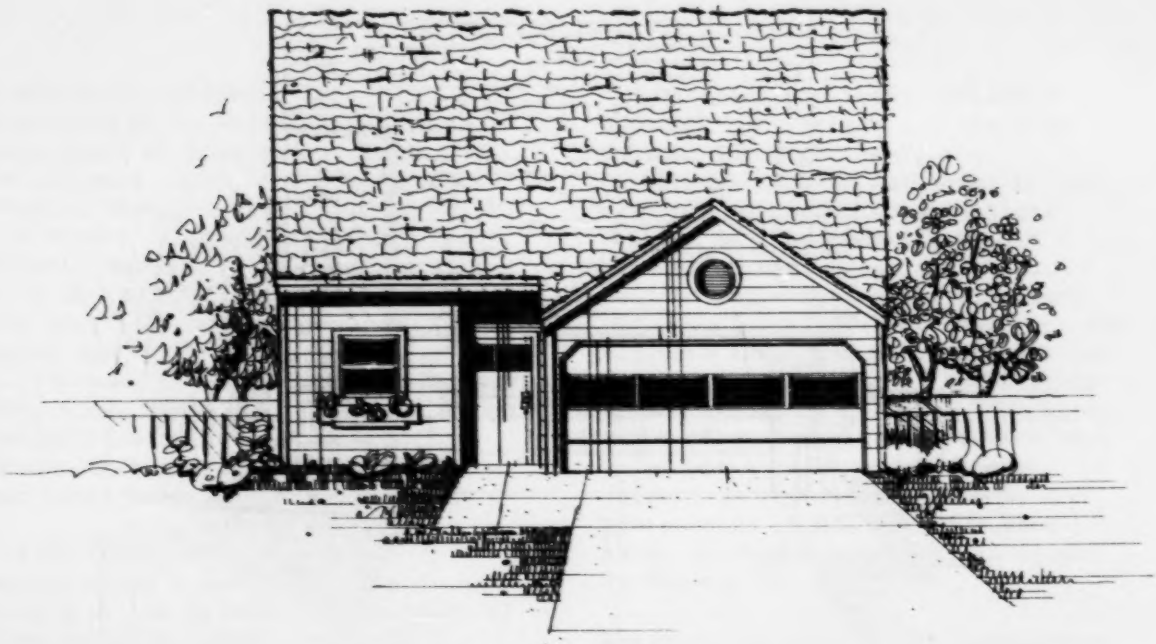


FLOOR PLAN - C



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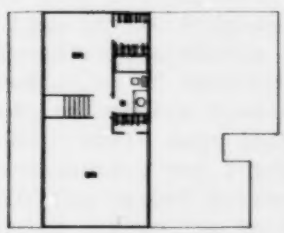
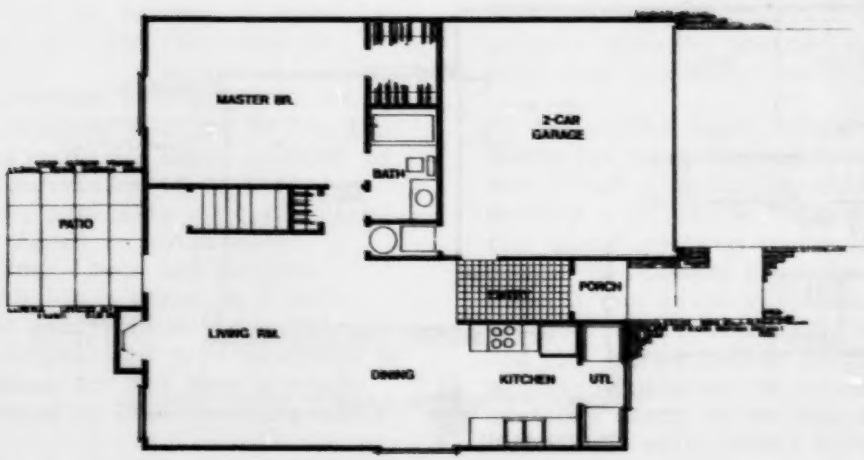


SECOND FLOOR (OPTIONAL)



FLOOR PLAN "D"

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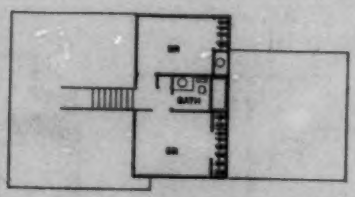

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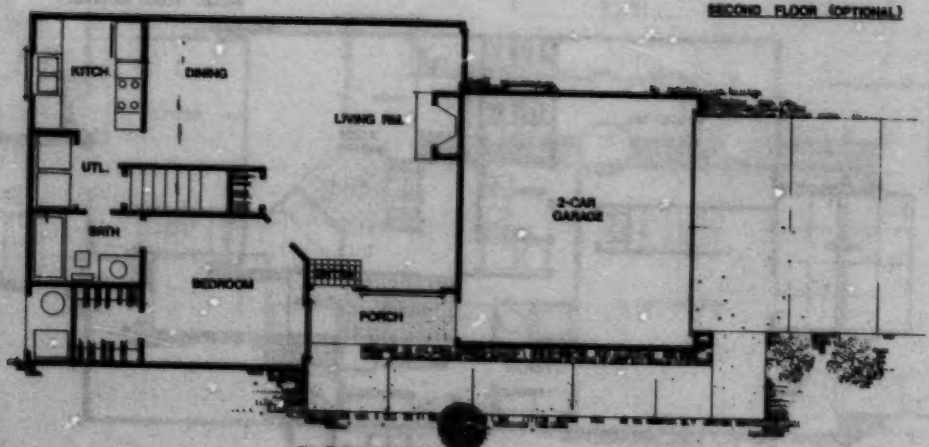


FLOOR PLAN E

Chapter 2

Project History

Immediately following the announcement in January 1982 by the Department of Housing and Urban Development (HUD) of the Affordable Housing Demonstration Program, Mayor Jim Inhofe directed Dr. John Piercey, Director of the Tulsa Department of City Development, to involve Tulsa in the program. HUD outlined for the mayor the steps needed for participation: cooperation of the city staff and commission and designation of a locally respected developer/builder to design, develop, and build a housing project.

The Builders Association of Metropolitan Tulsa, Inc., the local branch of the National Association of Home Builders (NAHB), reviewed applications from local developers interested in participating in the program. Hood was selected by HUD as builder/developer of the Tulsa Affordable Housing Demonstration Project on April 7, 1982.

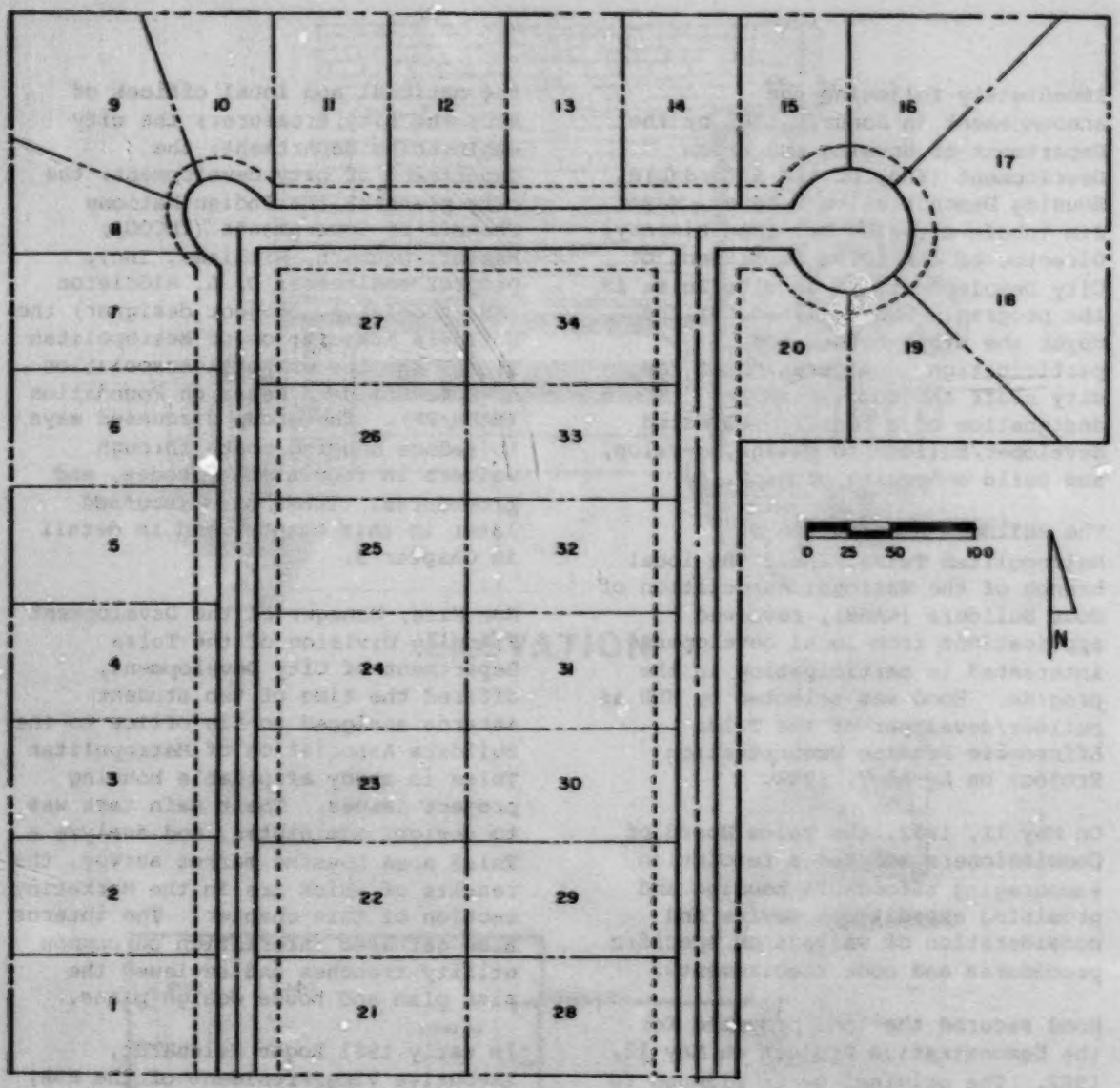
On May 11, 1982, the Tulsa Board of Commissioners adopted a resolution encouraging affordable housing and promising expeditious review and consideration of waivers of specific procedures and code requirements.

Hood secured the land proposed for the Demonstration Project on May 12, 1982. The original owner planned to build a subdivision of 34 homes on the site at a density of 4.42 units per acre, based on Tulsa code restrictions. Hood and Latimer immediately began planning a more innovative subdivision. The HBA arranged for various professionals to discuss ideas for the Hood project and the cause of lower housing costs.

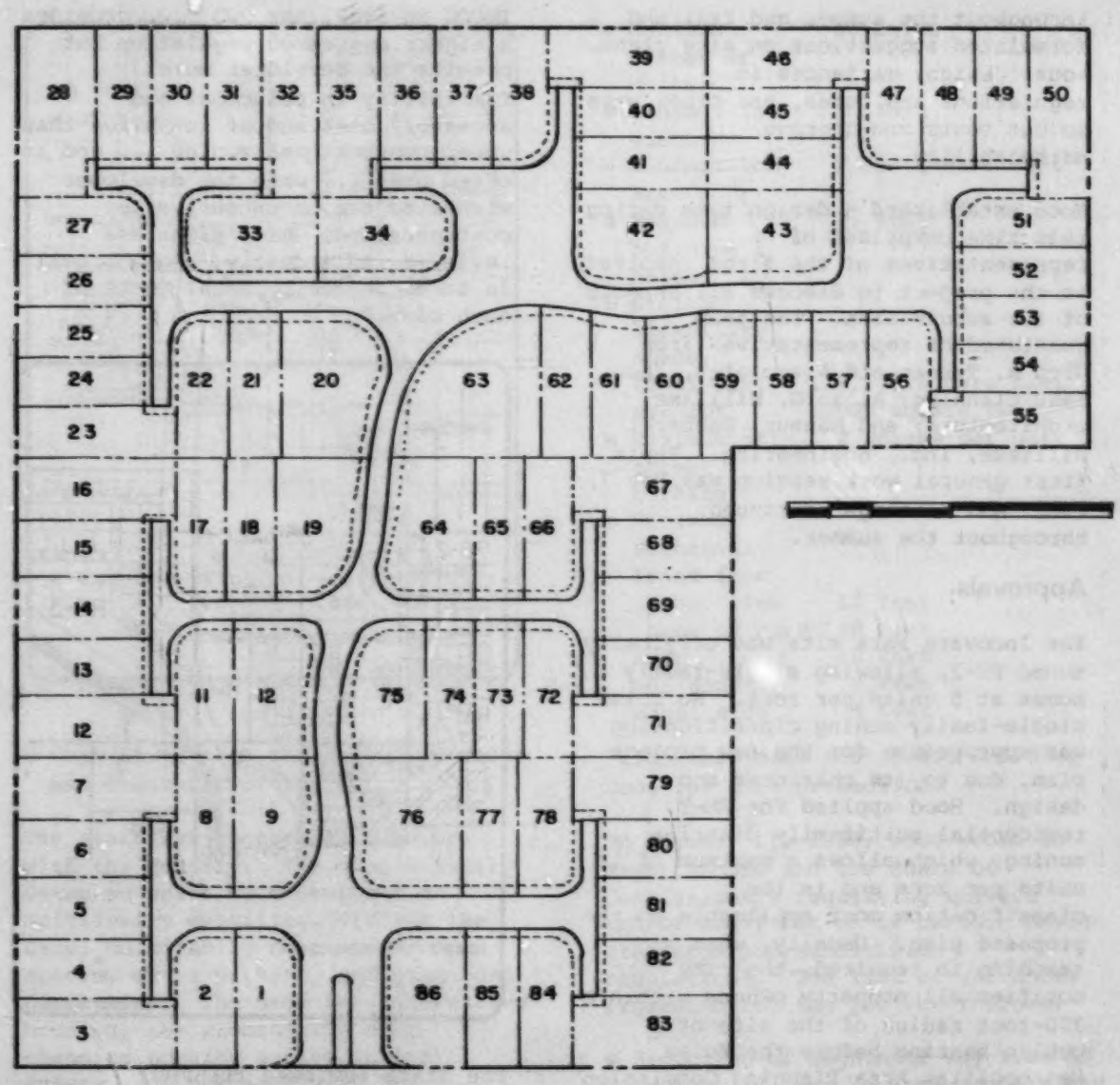
In June the first discussions occurred among all involved in the Tulsa project. Attendees at the meeting included representatives of the national and local offices of HUD; the city treasurer; the city engineering department; the department of city development; the city planner; the Indian Nations Council of Governments (INCOG); Mansur, Daubert, Williams, Inc., project engineers; D. L. Middleton and Associates, project designer; the Builders Association of Metropolitan Tulsa; and the National Association of Home Builders Research Foundation (NAHB/RF). The group discussed ways to reduce housing costs through waivers in regulations, codes, and procedures. These are discussed later in this chapter and in detail in Chapter 3.

Ron Mize, Manager of the Development Planning Division of the Tulsa Department of City Development, offered the time of two student interns assigned to his office to the Builders Association of Metropolitan Tulsa to study affordable housing project issues. Their main task was to design, administer, and analyze a Tulsa area housing market survey, the results of which are in the Marketing section of this chapter. The interns also gathered information on common utility trenches and reviewed the site plan and house design plans.

In early 1982 Roger Reinhardt, Executive Vice-President of the HBA, had formed a design council to provide a forum for exchanging ideas for those involved in the design phases of housing projects. The council was quite successful, and, when Tulsa was officially accepted for the demonstration program, Reinhardt offered the council as an advisory group to the project. Two committees were formed from the original design council for this purpose: a land development group and a housing design and construction group. The two committees met



Original site plan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Site plan

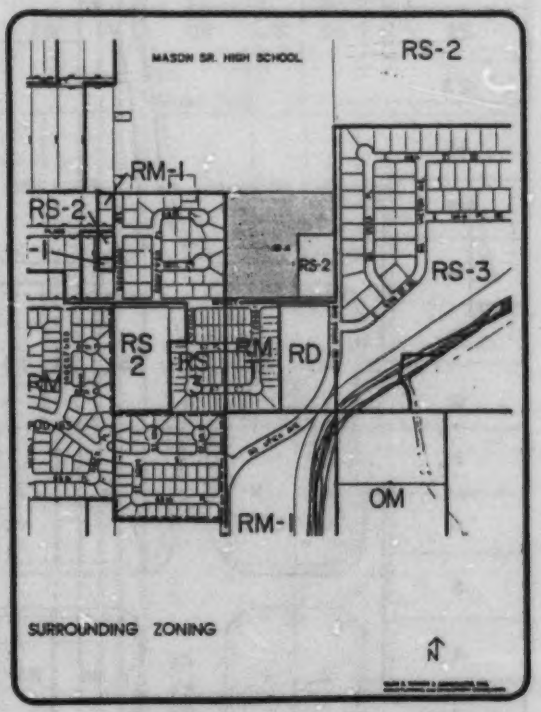
throughout the summer and fall and formulated suggestions on site plans, house design, variances in regulations and codes, and other ways to cut costs and improve marketability.

Hood established a design team during this time comprised of representatives of the firms involved in the project to discuss all aspects of the subdivision. The team consisted of representatives from Glen R. Turner and Associates, Inc., land planning; Allan G. Williams, architecture; and Mansur, Daubert, Williams, Inc., engineering. Their first general work session was May 7, 1982, and meetings continued throughout the summer.

Approvals

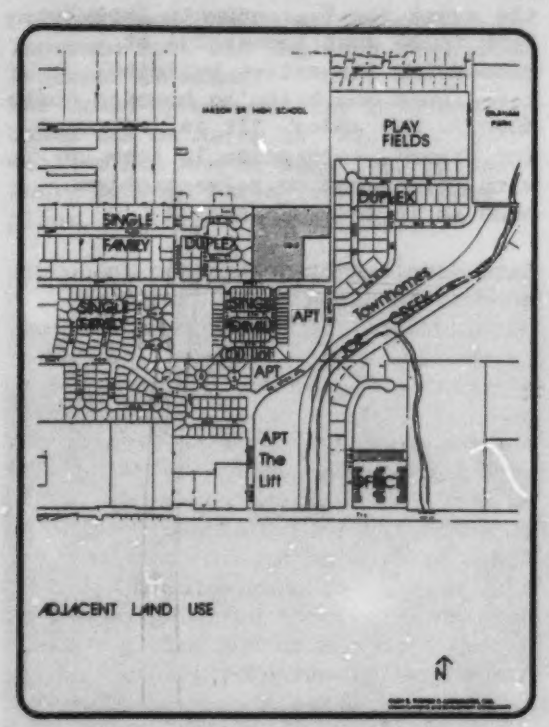
The Innovare Park site was originally zoned RS-2, allowing single-family homes at 5 units per acre. No Tulsa single-family zoning classification was appropriate for the new project plan, due to its character and design. Hood applied for RM-T, residential multifamily district zoning, which allows a maximum of 12 units per acre and is the classification most applicable to the proposed plan. Usually, when rezoning is required, the city notifies all property owners within a 300-foot radius of the site of a public hearing before the Tulsa Metropolitan Area Planning Commission (TMAPC) and then the County Commission. Since the areas adjacent to the demonstration site consisted of unoccupied land, Hood-owned land, and city-owned land, this time-consuming step was eliminated. Tulsa City staff recommended approval of the RM-T zoning in September 1982.

Hood applied for a supplemental Planned Unit Development (PUD) designation after receiving the RM-T zoning. According to land development procedures prepared by INCOG in 1982, the PUD "... provides a higher degree of regulation but permits the developer more flexibility in principal and accessory uses and of lot sizes than under conventional zoning ... and is often used ... when the developer wishes to use an unusual site configuration. Site plans are reviewed individually, and approval is based on the physical facts of each case."



The staff reviewed the PUD development plan and text application and characterized the proposed project as follows:

- Consistent with the comprehensive plan
- Harmonious with present and future development of the surrounding areas
- Unified in its treatment of the development possibilities of the project site



- Consistent with the stated purposes and standards of the PUD

The staff was concerned, however, with the density. The single-family detached units were proposed at multifamily densities, without the usual multifamily development open spaces, extra parking, and clubhouse facilities. The need for alternative housing, the probability of a changing housing market in the future, and the necessity for experimental projects to "more clearly define the housing needs," however, were recognized. On September 17, 1982, therefore, the staff supported, on an experimental basis, PUD request for Innovare Park. Approved development standards for the project were as follows:

• Area (gross)	347,680 square feet
(net)	336,678 square feet
• Permitted uses	Single-family detached dwellings on individual lots
• Maximum number of units	86 units
• Minimum lot width	30 feet
• Minimum lot area	2,250 square feet
• Maximum building height	35 feet
• Minimum livability space:	
total dev.	119,970 square feet
per lot	1,000 square feet
• Minimum off-street parking	2 spaces per unit
• Minimum setbacks:	
front from prop. line	12 feet
back of curb	18 feet
rear	10 feet
one side*	0 feet
other side	5 feet

*Sidewalls must meet Tulsa Building Code for fire protection.

On January 17, 1983, Hood wrote to Mayor Inhofe and the Board of Commissioners requesting waivers and/or modification of certain design standards and subdivision regulations. The list of variances requested for the project follows:

- Reduction of rights-of-way from 50 feet to 30 feet on some streets and 20 feet on others

- Reduction in street pavement widths (measured from flow line to flow line) from 26 feet to 22 feet on some streets and 18 feet or 12 feet on others

- Reduction of utility easements to 6 feet

- Substitution of a 4-inch roll curb for the usual 6-inch vertical curb

- Substitution of T-shaped access drives and turnarounds for cul-de-sacs
- Use of a 15-foot radius on right-of-way lines and curb lines
- Pavement section of 5-1/2 inches versus the standard 6-1/2 inches.

The mayor and commissioners referred the requested changes to the city engineer and fire department for report to the commission on February 4, 1983. The city engineer recommended 6-inch curbs be used instead of the requested 4-inch curbs and that his office review paving design standard tests.

The fire marshal objected to any residential street less than 26-feet-wide because he believed that to be the minimum amount of space needed to traverse an area safely. Commissioner Gardner argued in favor of the request, since fire trucks are often unable to turn around even on a 26-foot street and "have to adapt to the situation as it exists." He suggested an easement be added to the plan to allow emergency vehicle access to the area.

The mayor and commission approved the requested waivers, with the exception of the 4-inch curbs. They agreed to require a 6-inch curb and an emergency access easement.

The preliminary plat was sent to the planning commission for review on August 17, 1982. It was approved by the commission on September 23, 1982 following staff comment and review. Final plat approval was granted on January 18, 1983, after approval of the requested modifications.

The official ground-breaking for Innovare Park was on November 17, 1982. Dr. June Q. Koch, then HUD Deputy Under Secretary for Intergovernmental Relations, said at the event she "... expects Innovare Park to be most successful at pioneering innovative building techniques and bringing housing costs down." She added, "It is important for private enterprise to team up with government to solve problems, such as in Innovare Park."

Site development work began in earnest in March 1983. Building permits were issued for construction in October 1983. The models were officially opened during the grand opening on March 26-30, 1984. Phil Abrams, then HUD Under Secretary, reported at the ceremony, "Tulsa will be out front showing everybody in this country that a community that wants affordable housing can have it. Deregulation of housing codes in deference to local building codes, an emphasis on health and safety codes, and the elimination of luxury marketability features can reduce housing costs considerably."

Marketing

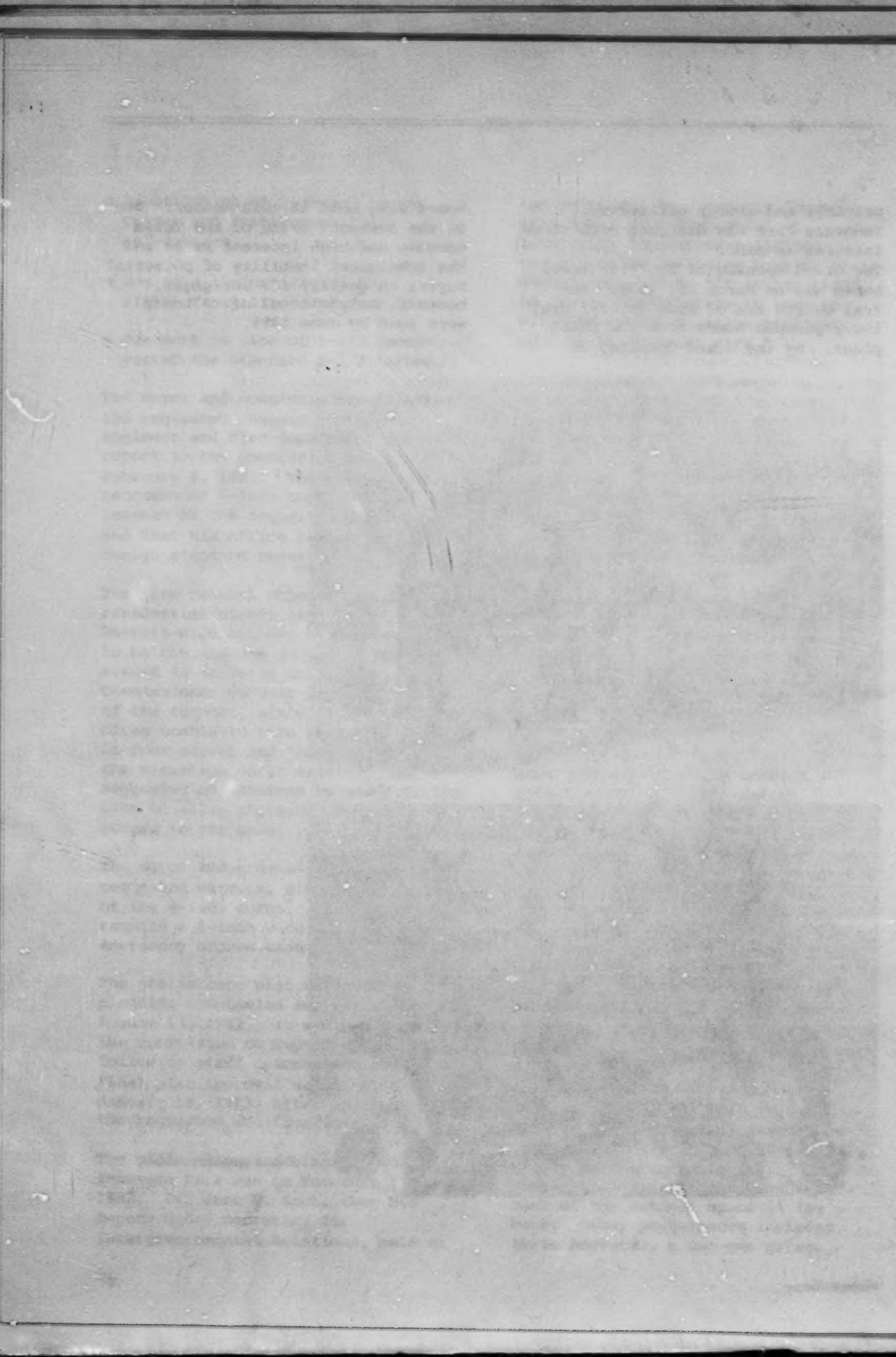
Hood does not normally conduct a formal market analysis before building. For this demonstration project, the local home builders association worked with two Oklahoma State University interns to produce a market study for the Tulsa area. First, they developed a market survey to determine "what homebuyers expect from the homes they buy today," and published it in the real estate section of the Tulsa World on two Sundays, July 11 and 18, 1982.

A total of 320 completed surveys were received and analyzed by the interns. They found that most respondents (97.5 percent) preferred to own a home, and 73 percent believed home ownership is a realistic goal. Ninety percent preferred single-family detached homes with most of the outdoor space in the back. Other preferences included three bedrooms, a two-car garage,

privacy, and energy efficiency. Innovare Park was designed with these features in mind.

The Grand Opening of the five model homes was on March 26, 1984. The real estate arm of Hood Enterprises, Inc., presold homes from the house plans. By the Grand Opening, 30 homes were sold in this manner. Due to the downward swing of the Tulsa economy and high interest rates and the subsequent inability of potential buyers to qualify for mortgages, however, only a total of 47 homes were sold by June 1985.

Grand opening ceremony



Chapter 3

Innovations and Their Impact on Costs

One purpose of the Affordable Housing Demonstration is to collect and evaluate cost data on residential development practices and construction techniques. The following analysis identifies the impact of regulations and standards on housing.

Change List Approval Process

The City of Tulsa was extremely cooperative with the developer and adopted a resolution encouraging construction of affordable housing. The Tulsa Board of Commissioners and Mayor James Inhofe promised to rapidly process and review requested regulatory changes. Charles Norman, a former city attorney, assisted in modifying the regulations.

A list of requested changes to normal practice was submitted directly to the mayor and the Board of City Commissioners, along with appropriate documentation. Each item was carefully considered. As was stated in Chapter 2, one was revised; Hood requested a 4-inch roll curb, but the city insisted on a 6-inch roll curb. All other requests were accepted. Some were already acceptable under the Planned Unit Development (PUD) ordinance; others were accepted for the demonstration only, based upon the documentation and logic presented by Hood.

Administrative and Processing Changes

To expedite the requested changes, the city allowed Hood to submit all required applications and plans directly to the Board of Commissioners. No processing time was saved, since Hood was also working on other projects and awaiting results of market surveys. If he had moved quickly on Innovare Park, processing time probably would have been reduced by at least three months, resulting in additional cost savings of about $600 per unit. An unusual period of heavy rains postponed construction by two to three months which would have cancelled any fast processing time savings.

Site Planning and Development Changes

Site planning and land development are major areas of cost reduction for most builder/developers. Hood cut per unit costs of developed land dramatically by increasing density from 4.4 units per acre to 11 units per acre, reducing street widths, eliminating sidewalks, decreasing rights-of-way, and using mountable curbs and T-turnarounds instead of cul-de-sacs.

The original zoning for Innovare Park, R.S. 2, single-family, would have allowed a maximum density of 5 units per acre. For the demonstration, the city allowed lot sizes as small as 2,340 square feet with 30-foot frontages. Although the units were detached, Innovare Park was rezoned to multifamily. The builder presented the argument to the city that multifamily housing could be unattached.

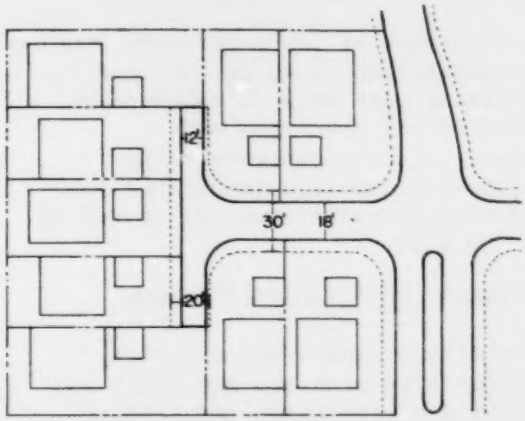
The city approved, for Innovare Park only, reduction of rights-of-way (ROW) from 50 feet to 30 feet with 12-foot front yard and 6-foot back yard utility easements. Building setback requirements were reduced from 20 feet to 12 feet. Also approved was the use of T-turnarounds with 20-foot ROW, versus 50-foot ROW radius cul-de-sacs. Had the same land plan been attempted using

existing Tulsa standards, about 40 percent of the land would have been in the ROW. Therefore, it is impractical to compare Innovare Park as built with the same land plan if built to existing standards. Hood provided an alternate land plan for the subdivision were it developed under existing standards. The net result of rezoning, reducing ROW and setbacks, and replatting for maximum land use was an increase in density from 34 to 86 units.

Undeveloped land costs were $35,000 per acre. Using 34 units at 4.4 units per acre, raw land would have cost $7,926 per unit. Due to the density increase to 86 units, raw land cost was only $3,134, for a savings of $4,792 per unit.

Street widths were reduced from 23 feet to 18 feet on collector streets, measured from flow line to flow line. T-turnaround paving, 12 feet wide, was used instead of 38-foot-radius (76-foot diameter) cul-de-sacs. One short street section connecting two T-turnarounds was 17 feet wide. Average lot frontage widths were reduced from about 70 feet to about 34 feet. Therefore, average square feet of paving per unit was reduced 47 percent for a savings of $529 per unit.

Mountable curbs are normally prohibited in Tulsa. Hood proposed a 4-inch mountable curb, standard in many cities. The city approved mountable curbs, but instead of 4 inches high, they were to be 6 inches high. This created some design problems for Hood, who had to fabricate his own mules, or extrusion templates, for the curb. Also, to keep cars from scraping the curb, it sloped at a lesser angle away from the back of the curb. Although curb costs were the same as for standard 6-inch vertical curbs, the mountable curb eliminated a $15 Tulsa curb cut permit. Also, the density increase resulted in an overall per unit cost saving. Total curb costs were reduced by $245 per home.

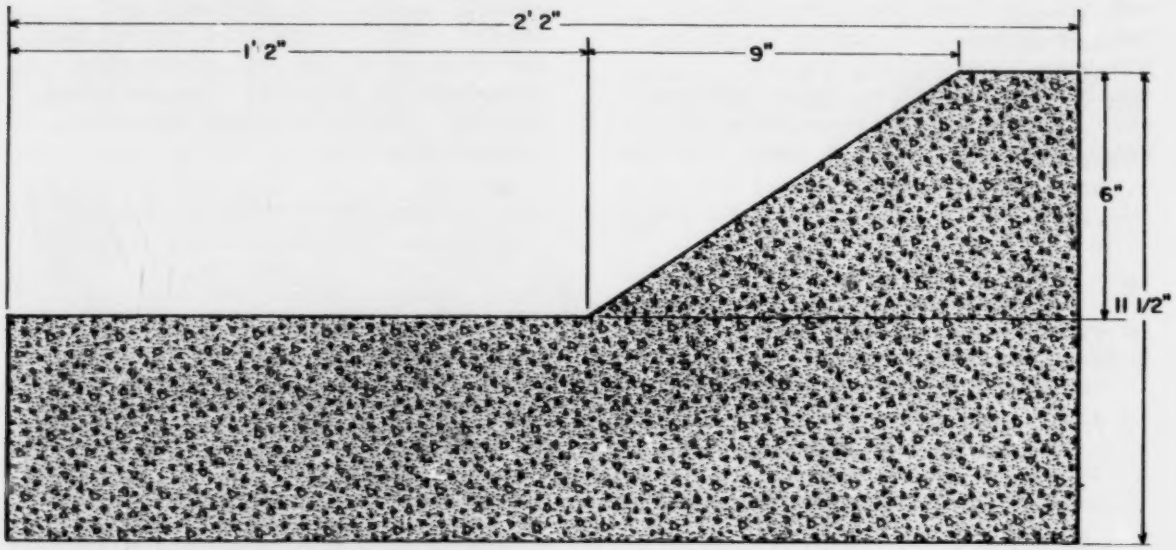


T-turnaround

Storm water management in Innovare Park was expensive. The site required underground drainage for the 80-acre adjacent parcel as well as for Innovare Park. A reinforced concrete culvert was required with one section 7-feet wide, 4-feet high and one section 6-feet wide, 4-feet high. Drop inlets, junction boxes, manholes, and short sections of 15-, 18-, 21-, and 24-inch-diameter reinforced concrete pipe additionally increased the storm sewer cost. Had the site been developed conventionally, drainage would have been even more costly because two collector streets with smaller box culverts would have been drained instead of one. Because of higher density and the slightly less expensive system, storm water drainage costs were reduced by $3,420 per unit.

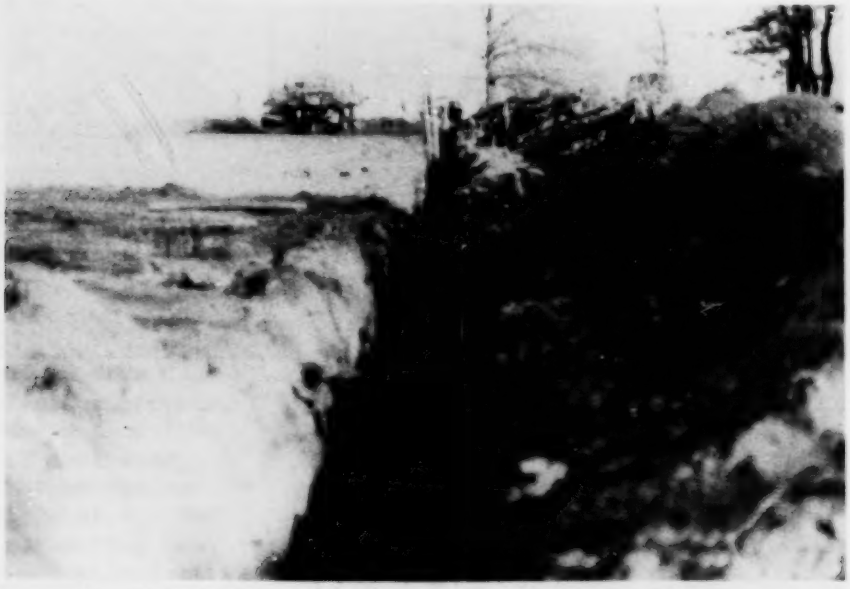
Common trenching for utilities was allowed (for the first time in Tulsa) in Innovare Park. The trench was 2 feet wide and 4 feet deep in the center of the utility easement. Since gas, electric, and telephone services were provided free to the developer, the common trench did not directly reduce costs for Hood. These utility companies did not give

6" MOUNTABLE CONCRETE CURB

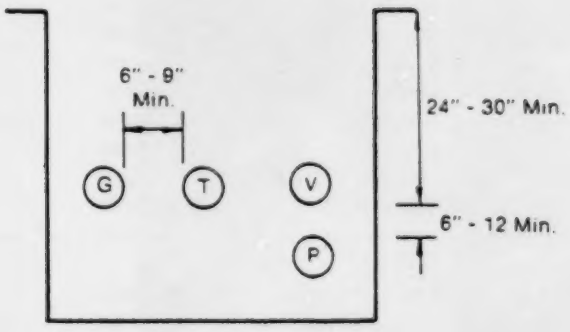


Roll curb

Hood a rebate for the trench. However, these kinds of savings can be realized by the utility companies and help to keep the rates down. Hood believed that common trenching did save time overall and was worthwhile. No other major changes were allowed in sanitary sewer or water service. Plastic sewer pipe is prohibited in Tulsa, so vitrified clay pipe was installed. Common sanitary sewer laterals servicing several units were proposed and denied, even though Hood argued that the density of the units was more like that of attached than detached housing. Attached homes may have common laterals.



Common trench during site development work



Legend

G - Gas	V - Television
T - Telephone	S - Secondary
P - Power	

Common trench utilities location

No major deviation from Tulsa standards was allowed for water service. Hood estimated that plastic water pipe would have reduced cost substantially. Ductile iron mains and copper laterals were used instead. Water main pipe was reduced from 6 to 2 inches at the very end of the lines, since Innovare Park was at the end of the main. About 500 feet of pipe was affected. Because of the increased density, savings amounted to $829 per unit for sanitary sewer and $349 per unit for water service.

Tulsa allowed Hood to eliminate sidewalks in Innovare Park. Typically, sidewalks are required on both sides of the street. Cost savings per unit amounted to $225.

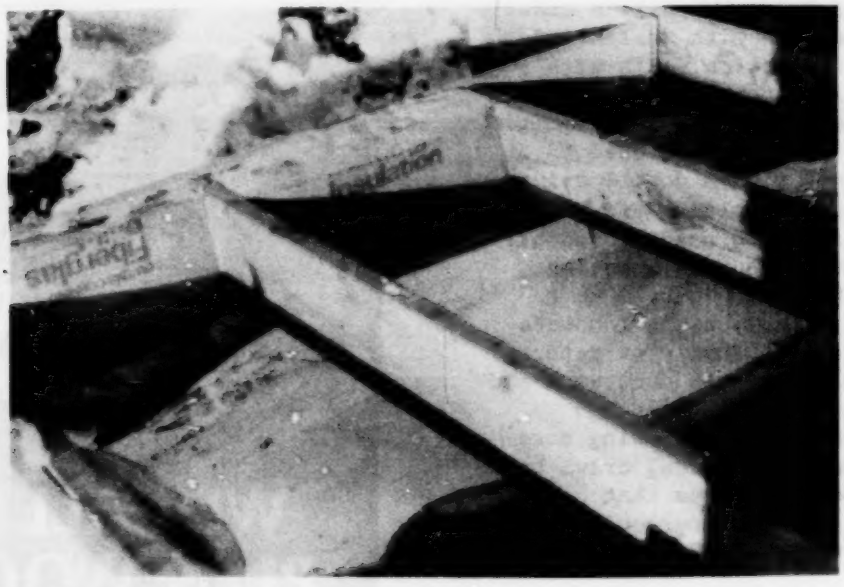
The telephone company prewired the distribution lines for Innovare Park and installed the entire system in four hours. There is potential for cost saving in this installation method, but the telephone company did not rebate normal charges in Innovare Park.

Building Design and Construction

Hood used several innovative techniques in constructing the Innovare Park homes. Although these techniques were already allowed by the Tulsa building code (based on the Standard Building Code, Southern Building Code Congress International,) they were normally not used in the Tulsa area.

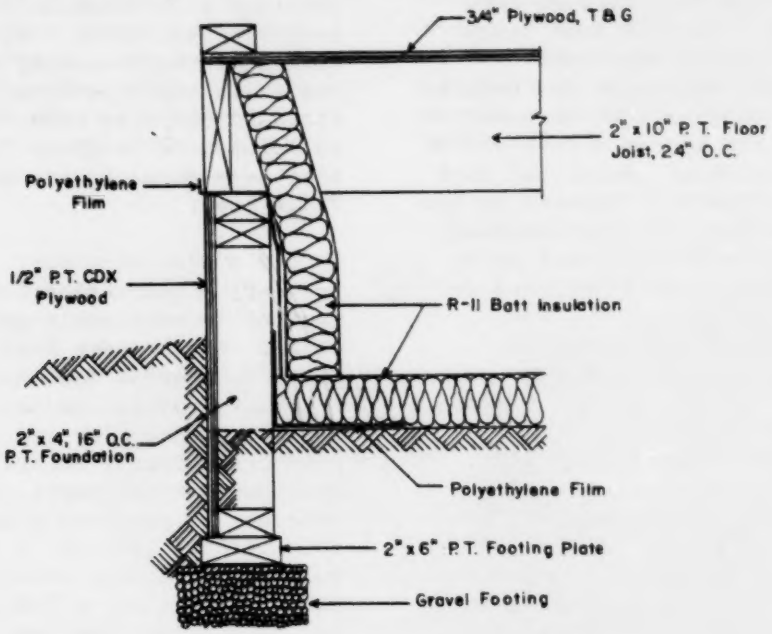
Concrete slab-on-grade foundation/floor construction is typical in moderately priced homes in Tulsa. In Innovare Park, Hood used a pressure-treated wood crawl space foundation with wood joists. This system, promoted by the forest products industry as the Permanent Wood Foundation (PWF), requires no concrete or concrete block in the foundation. Instead, a wood frame wall, with plywood exterior skin pressure-treated to FDN standards, is set on a gravel footing.

In addition to using the PWF, the underfloor area was used as a return



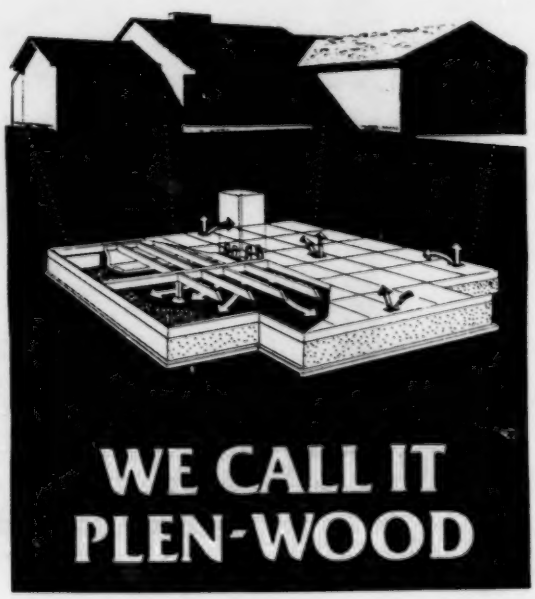
Floor insulation

Underfloor Return Air Plenum
With Pressure Treated Wood Foundation


3/4" Plywood, T&G
2" x 10" P.T. Floor Joist, 24" O.C.
Polyethylene Film
1/2" P.T. CDX Plywood
R-11 Batt Insulation
2" x 4", 16" O.C. P.T. Foundation
Polyethylene Film
2" x 6" P.T. Footing Plate
Gravel Footing

air plenum for the heating/cooling system of the home. Supply air was provided through dropped ceilings. This system, also promoted by the forest products industry, is called Plen-Wood and is basically a crawl space foundation with sealed and insulated foundation walls with a plastic film vapor barrier over the entire underfloor ground surface. Typically, this area is used as a supply plenum with a downflow furnace pressurizing the plenum and floor registers allowing conditioned air to escape into the home. Sometimes, however, the space is used as a return air plenum, as in Innovare Park. In either supply or return, the system eliminates duct work and provides warmth in winter and coolness in summer, allowing more comfort than the typical crawl space floor. Hood estimated that foundation and heating/cooling costs were reduced by $1,470 per unit.

The Romans had a word for it *

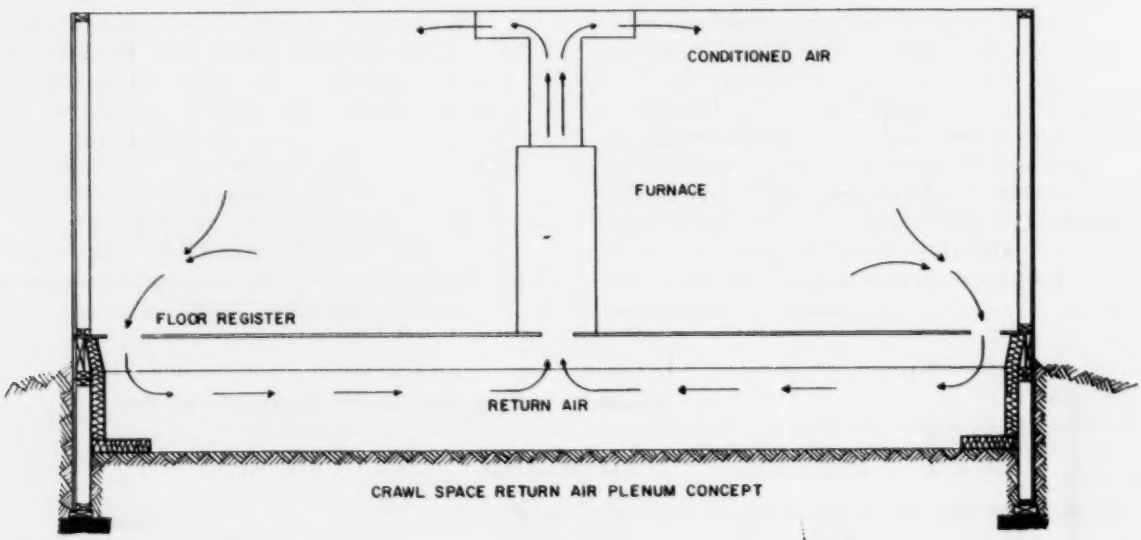


The builder used polybutylene plumbing instead of copper in all Innovare Park homes. Estimated savings amounted to $100 per unit.

Exterior walls in Innovare Park were framed with studs spaced 16 inches on center. Interior partitions were framed 24 inches on center. Two-stud corners were used throughout with metal drywall back-up clips. Partition posts where interior walls intersect exterior walls were eliminated and replaced with one block at mid-height and drywall back-up clips. Headers were eliminated in nonload-bearing interior partitions. Total framing cost reduction amounted to an average of $250 per home.

Typically, Hood would have installed kitchen base cabinets with drawers in each cabinet other than the sink base. In Innovare Park, only one 18-inch-wide full drawer cabinet was installed; no other base cabinets had drawers. Total costs savings, according to Hood, amounted to $125 per unit.

Because of the right-of-way reduction and minimum setback requirements, driveways were shortened by an average of 10 feet each, reducing costs by $134 per unit.



CRAWL SPACE RETURN AIR PLENUM CONCEPT

WE CALL IT
PLENAWOOD

Chapter 4

Details of Changes and Their Costs

Comparison Costs

This chapter discusses the cost savings of changes in Tulsa's regulations and Hood Properties' typical practices that resulted in cost reductions. Included are innovative techniques Hood used that are not normally used by other builders in the area.

Administrative and Processing Changes

In May 1982 the City of Tulsa Board of Commissioners adopted a resolution encouraging affordable housing and promised expeditious review of submissions and liberal waiver of procedures and code requirements. In August Hood submitted his site plans to the Tulsa Planning Commission and received cooperation in review and processing. Because Hood Enterprises was unready for development at this time, no actual time savings were realized. In fact, Hood's list of proposed changes was not submitted to the Board of Commissioners until January 1983. The changes were approved in April 1983. Had Hood begun land development and construction earlier, the City of Tulsa probably would have decreased total processing time for the project.

Site Planning and Development Changes

This section compares Innovare Park land costs and land development costs with the project that would have been built had existing Tulsa standards and practices prevailed. Fifty-two building lots were added because of demonstration changes. Therefore, cost savings per unit are based on the demonstration's 86-unit plan compared with the 34-unit plan, representing the optimal land use under existing standards. To obtain maximum density, total costs for land development were increased by over $41,000. Cost per unit, however, decreased by $10,390. The following is a summary of land and land development costs and a detailed analysis of each.

Land Development Cost Comparison Summary

	Demonstration	Comparison	Savings Per Unit
Land	$269,500	$269,500	$4,792
Sanitary Sewer	67,202	54,733	829
Water Service	50,305	31,770	349
Storm Sewer	190,128	191,465	3,420
Streets/Paving	46,407	36,349	529
Curbs and Gutters	28,848	19,712	245
Sidewalks	- 0 -	7,639	225
TOTALS	$652,390	$611,168	-
COST PER UNIT	$ 7,586*	$ 17,976**	$10,390

* 86 units
** 34 units

Sanitary Sewer

The sanitary sewer in Innovare Park was built exactly to city standards. The greater number of units increased total costs, but the revised land plan and increased density realized substantial savings per unit.

Sanitary Sewer Cost Comparison

	Demonstration	Comparison	Savings
ROW grading	$3,192	$2,467	-
Excavation & backfill	5,320	4,096	-
8" vitrified clay pipe	21,938	4,096	-
4" lateral pipe	6,880	4,080	-
4' std. manholes	12,800	10,400	-
Std. connection	2,100	2,100	-
Plug exist manhole	300	300	-
Lamp hole	1,200	1,200	-
Conc. encasement	672	672	-
Special structure	1,800	1,800	-
Inspection fee	11,000	11,000	-
TOTALS	$67,202	$54,733	($12,469)
COST PER UNIT	$ 781	$ 1,610	$ 829

* 86 units
** 34 units

Water Service

Specifications for water service were unchanged except that about 500 feet of 2-inch-diameter ductile iron pipe was substituted for 6-inch-diameter pipe at the end of the water service. The major savings were due to the increase in density from 34 to 76 units. Cost comparisons follow.

Water Service Cost Comparison

	Demonstration	Comparison	Savings
Trenching	$ 5,200	-	-
6" dia. ductile iron pipe	12,200	-	-
2" dia. ductile iron pipe	1,000	-	-
1" dia. copper pipe	750	-	-
5/8 dia. copper pipe	250	-	-
Meters	7,980	-	-
Corporation stops	7,525	-	-
Hydrants	4,000	-	-
Tap into main	11,400	-	-
Trenching	-	4,400	-
6" dia. ductile iron pipe	-	11,600	-
1" dia. copper pipe	-	500	-
5/8 dia. copper pipe	-	100	-
Meters	-	3,570	-
Corporation stops	-	3,500	-
Hydrants	-	3,000	-
Tap into main	-	5,100	-
TOTALS	$50,350	$31,770	($18,580)
COST PER UNIT	$ 585*	$ 934**	$ 349

* 86 units
** 34 units

Storm Sewers

Provisions for storm water drainage in Innovare Park were substantial. The site condition required an underground system consisting of a large two-part (6'x 4' and 7'x 4') reinforced concrete box culvert, catch basins, junction boxes, manholes, and the like. The revised site plan and higher density created substantial savings per unit. Had the 34-unit site plan been built, two smaller main culverts would have been required instead of the large, reinforced concrete box culvert. Following are cost comparisons.

Storm Sewer Cost Comparison

	Demonstration	Comparison	Savings
Excavation	$ 9,145	-	-
Reinf. conc. pipe 15",18",21",24"	15,021	-	-
Reinf. conc. box 6'x4', 7'x4'	108,207	-	-
90° bend for 6'x4' reinf. conc. box	8,200	-	-
Reinf. conc. jun. boxes	17,200	-	-
Std. 4' dia. manhole	800	-	-
Shallow 4' dia. manholes	2,100	-	-
Reinf. conc. inlet	2,760	-	-
Single grate drop inlets	15,870	-	-
Double grate drop inlets	4,375	-	-
Miscellaneous	6,450	-	-
Excavation	-	$ 8,372	-
Reinf. conc. pipe 24"	-	8,208	-
Reinf. conc. box 5'x 4'	-	129,600	-
Std. 4' dia. manhole	-	4,000	-
Shallow 4'dia. manhole	-	700	-
Reinf. conc. inlets Single & double	-	16,935	-
Reinf. conc. jun. boxes	-	17,200	-
Miscellaneous	-	6,450	-
TOTALS	$190,128	$191,465	$1,337
COST PER UNIT	$ 2,211*	$ 5,631**	$3,420

* 86 units
** 34 units

Streets/Paving

Tulsa city standards require 23-foot-wide streets throughout and cul-de-sacs with radii of 38 feet. Street sections consist of a 3.5-inch bases with a 2-inch thick asphalt surface. To service the 34 units under these standards, a total 35,552 square feet of paving (1045.65 SF/unit) would have been needed.

Changes in city standards for the demonstration resulted in streets 18 feet wide. Cul-de-sacs were eliminated and 12-foot-wide turnarounds used instead. One short (40') section of street connecting a secondary street to a T-turnaround was 17 feet wide. Two common parking areas were paved, and street sections were unchanged. Total paving surface for the 86 units was 47,925 square feet or 557 square feet per unit. The result was a 488-square-foot paving reduction per unit. Cost comparisons follow.

Street/Paving Cost Comparison

	Demonstration	Comparison	Savings
18'& 17' wide streets, 12' wide T-turnarounds, common parking spaces			
Excavation	$ 4,809	-	-
Grading	4,854	-	-
Paving	35,944	-	-
Manhole lids (4)	800	-	-
23' wide street, 1.5 38' dia. Cul-de-sac			
Excavation	-	$ 3,559	-
Grading	-	3,592	-
Paving	-	26,598	-
Manhole lids (13)	-	2,600	-
TOTALS	$46,407	$36,349	$(10,058)
COST PER UNIT	$ 540*	$ 1,474**	$ 529

* 86 units
** 34 units

Curbs and Gutters

Hood used rollover, 6-inch-high mountable curbs rather than standard 6-inch vertical curbs and gutters. Hood installed 4,543 feet of combined mountable curb and gutter in Innovare Park for an average of 52.8 feet per unit. If built with conventional vertical curbs, the development would have had approximately 2,816 feet of curb and gutter or 82.8 feet per unit.

Curb And Gutter Cost Comparison

	Demonstration	Comparison	Savings
6" high, 14" wide mountable curb and gutter	$28,848	-	-
6" high, 14" wide vertical curb and gutter	-	$19,712	-
TOTALS	$28,848	$19,712	$(9,136)
COST PER UNIT	$ 335*	$ 580**	$ 245

* 86 units
** 34 units

Sidewalks

The City of Tulsa allowed Hood to eliminate sidewalks in Innovare Park. Typically, sidewalks are installed on both sides of the street, which would have required 2,586 lineal feet of sidewalk.

Sidewalk Cost Comparison

	Demonstration	Comparison	Savings
4" thick, 4' wide concrete sidewalk	-	$7,639	$7,639
TOTALS	-	$7,639	$7,639
COST PER UNIT	-*	$ 225**	$ 225

* 86 units
** 34 units

Building Design and Construction Changes

This section examines the cost-saving techniques used in direct construction of the units. As mentioned in Chapter 3, there was a mixture of house sizes, with the smallest containing 750 square feet and the largest containing 1,100 square feet. Because of size differences, costs in this section are averaged over all units.

Construction Cost Saving Summary

Demonstration	Conventional	Cost Savings Total	Cost Savings Per Unit
Foundation/Floor/HVAC	Foundation/Floor/HVAC		
Underfloor plenum system. Pressure-treated wood foundation, 2x8 PT floor joists, 24" o.c., 3/4" PT T&G plywood floor, vapor barrier, foundation insulation, upflow furnace, no ductwork	8"x16" conc. footing, rebars, 8" thick, 24" high foundation wall, under-the-slab gravel, vapor barrier, rigid foam plastic insul., 4" conc. slab, welded wire mesh	$126,420	$1,470
Plumbing	Plumbing		
Polybutylene hot & cold water supply	Copper hot & cold water supply	8,600	100
Framing	Framing		
24" nonload-bearing walls, 2 stud corners, metal drywall backup clips	16" o.c. nonload-bearing walls, 3 stud corners	21,500	250
Cabinets	Cabinets		
No drawers in base cabinets. One 18" drawer cabinet	Drawers in all base cabinets	10,750	125
Driveway	Driveway		
Average 12' long due to reduced ROW	Average 22' long	11,524	134
TOTALS		$178,794	$2,079

Heating and Cooling

The most innovative feature of the Innovare Park homes was the use of the underfloor or crawl space area as a return air plenum. This system has been promoted since 1978 by the American Plywood Association, the American Wood Council, the National Forest Products Association, the Southern Forest Products Association, and the Western Wood Products Association under the name Plen-Wood.

The system is based on a simple concept. Instead of using heating and cooling ducts, the entire underfloor space is used as a sealed plenum chamber. The system is usually used as a distribution system, but Hood used it as the return air plenum, an acceptable alternative discussed in the Plen-Wood manual. Basically, it consists of wood floor construction with sealed and insulated foundation walls. Hood also used a preservative-treated lumber/plywood foundation being promoted as the Permanent Wood Foundation System or PWF. The heating/cooling system consists of a high-efficiency upflow unit with the return air being drawn from the house into the underfloor area through floor registers in each room.

The conditioned air distribution system or supply was provided by tightly sealed, dropped ceilings in hallways with registers into each room. No ductwork was required for either supply or return air except for a short section from the furnace into the dropped ceiling.

Typically, Tulsa homes are built with concrete slab-on-grade foundation/floors and ducted heating/cooling systems. Crawl space homes with wood floors are rare and are usually in more expensive homes.

Hood claims that the combination of PWF and Plen-Wood heating and cooling reduced total construction costs by $1,470 per unit.

Plumbing

Innovare Park was one of the first Tulsa subdivisions to use polybutylene supply piping instead of copper. Hood estimated that plumbing costs were reduced by $100 per house.

Framing

Exterior walls were framed with stud spacing 16 inches on center, and interior nonload-bearing partitions were framed 24 inches on center. Two-stud corners with metal drywall back-up clips were used throughout.

Kitchen Cabinets

Hood saved $125 per unit by installing kitchen cabinets with full height doors without drawers and one small 18-inch-wide cabinet with drawers. A small under-sink dishwasher saved space and reduced counter top costs. This saved $125 per unit.

Reduced Driveway Length

Reduced setbacks shortened driveways by an average of 10 feet each, reducing costs by $134 per unit.

Indirect Costs

Many builders apply a percentage factor to all direct construction costs to obtain indirect costs and profit. Indirect costs include construction overhead, warranty reserve, loan interest, mortgage discount points, sales commissions, advertising, administrative overhead, and profit. Hood estimated that total indirect savings or markups on savings amounted to about $1,500 per unit.

Cost Reduction Summary

The following is a summary of cost savings realized in Innovare Park due to reduced governmental regulations and builder/developer changes to typical practice in the City of Tulsa.

Cost Savings

	Per Unit
Land Development	$10,390
Building Design and Construction	2,079
Indirect	1,500
TOTAL	$13,969

*U.S. GOVERNMENT PRINTING OFFICE: 1986-620-563:40695

U.S. Department of Housing and Urban Development

451 Seventh Street, S.W.
Washington, D.C. 20410

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Postage and Fees Paid
U.S. Department of Housing
and Urban Development
HUD-401

January 1986
HUD-1008-PDR